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The second power, and the fourth power, of (3) give respectively, $x^2+\dfrac{1}{x^2}=a^2\left(y+\dfrac{1}{y}\right)^2-2\ldots\ldots(5)$, and $x^4+\dfrac{1}{x^4}+4\left(x^2+\dfrac{1}{x^2}\right)+6$ $=a^4\left(y+\dfrac{1}{y}\right)^4\ldots\ldots(6)$. From (6), by means of (5), we have $x^4+\dfrac{1}{x^4}+4\left[a^2\left(y+\dfrac{1}{y}\right)^2-2\right]+6=a^4\left(y+\dfrac{1}{y}\right)^4\ldots\ldots(7)$.

From (4) and (7), $\left(y+\dfrac{1}{y}\right)^4-\left(\dfrac{4a^2}{a^4-b}\right)\left(y+\dfrac{1}{y}\right)^2=-\dfrac{2}{a^4-b}\ldots\ldots(8)$.

$$\therefore\quad y+\frac{1}{y}=\frac{2a^2\pm\sqrt{[2(a^4-b)]}}{a^4-b}=\sqrt{u}\ldots\ldots(9).$$

From (9), $y=\frac{1}{2}[\sqrt{u}\pm\sqrt{(u-4)}]\ldots\ldots(10)$. From (3), by means of (9), we deduce $x=\frac{1}{2}[a\sqrt{u}\pm\sqrt{(a^2u-4)}]\ldots\ldots(11)$.

II. **Solution by G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia, and P. S. BERG, Apple Creek, Ohio.**

We may write the expressions as follows:

$\dfrac{1+x^2}{x}=a\left(\dfrac{1+y^2}{y}\right)$, and $\dfrac{1+x^8}{x^4}=b\left(\dfrac{1+y^8}{y^4}\right)$, or $x+\dfrac{1}{x}=a\left(y+\dfrac{1}{y}\right)$, and $x^4+\dfrac{1}{x^4}$ $=b\left(y^4+\dfrac{1}{y^4}\right)$. Let $x+\dfrac{1}{x}=z$, and $y+\dfrac{1}{y}=v$.

$$\therefore\quad z=av\ldots\ldots(1),\ z^4-4z^2+2=b(v^4-4v^2+2)\ldots\ldots(2).$$

Substitute (1) in (2), we get, $a^4v^4--4a^2v^2+2=bv^4-4bv^2+2b$.

$$\therefore\quad (a^4-b)v^4-4(a^2-b)v^2=2(b-1).$$

$$\therefore\quad v^2=\frac{2(a^2-b)}{a^4-b}\pm\frac{\sqrt{[2(a^2-b)^2+2b(a^4+1)]}}{a^4-b}=u \text{ suppose.}$$

$$\therefore\quad v=\pm\sqrt{u},\ z=\pm a\sqrt{u}.$$

$\therefore\ x+\dfrac{1}{x}=\pm a\sqrt{u}$, or $x^2\pm a\sqrt{u}x=-1$, and $y+\dfrac{1}{y}=\pm\sqrt{u}$, or $y^2\pm\sqrt{u}y=-1$

$\therefore\quad x=\pm\frac{1}{2}(a\sqrt{u}+\sqrt{[a^2u-4]})$, $y=\pm\frac{1}{2}(\sqrt{u}+\sqrt{[u-4]})$, which are the correct results, and the same as given by the proposed in a previous number of the MONTHLY.

NOTE—A neat solution to No. 26, Algebra, was received from Jno. B. Fraught, A. B., Instructor in Mathematics, Indiana University, after copy had been sent to the Publishers.

PROBLEMS.

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39. **Proposed by ARTEMAS MARTIN, LL. D., U. S. Coast and Geoditic Survey Office, Washington, D. C.**

Find x, y, z and w from the equations

$$x^4+y^4+z^4+x^2+y^2+z^2=112,$$
$$x^4+z^4+w^4+x^2+z^2+w^2=382,$$
$$x^4+y^4+w^4+x^2+y^2+w^2=294,$$
$$y^4+z^4+w^4+y^2+z^2+w^2=364.$$

40. Proposed by B. F. BURLESON, Oneida Castle, New York.

Find by quadratics all the possible values for x and y in the equations $x^3+y^3=b=35$, ...(1), and $x^2+y^2=a=13$:...(2).

41. Proposed by A. H. BELL, Hillsboro, Illinois.

In a right angled triangle there are given, the bisectors of the acute angles. Required the triangle.

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GEOMETRY.

Conducted by B. F. FINKEL, Kidder, Mo. All contributions to this department should be sent to him.

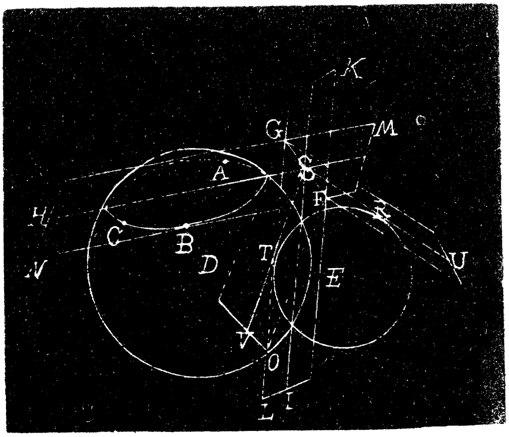
SOLUTIONS TO PROBLEMS.

28. Proposed by Professor HENRY HEATON, M. S., Atlantic, Iowa.

Through three given points to pass two spherical surfaces tangent to a given sphere.

Solution by G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia.

Let A, B, C be the three given points, and E the given sphere.



Through A, B, C describe any sphere cutting the sphere E. Let D be this sphere. Let the planes through A, B, C and the intersection of E, D intersect in the line FG. Through FG pass the planes FH, GO tangent to E at R, T. Then the spherical surfaces through $ABCR$ and $ABCT$ will be the surfaces required.

For draw the diameter of D perpendicular to the plane ABC, then perpendicular to this diameter and through the centre of the circle made by the plane A, B, C, in the plane A, B, C draw the line SH, also through the centre of the circu-